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REMARKS

In section 1 of the Office Action, the Examiner rejected claims 30-32 under 35 U.S.C. §103(a) as being unpatentable over the Ip patent in view of the Lutenegeger patent or in view of the Narita published EP application.

Applicants' Argument - The Ip patent discloses a sensor/packaging arrangement in which a ceramic case 40 encloses and supports an acceleration sensor die 20. As can be seen from the drawings of the Ip patent, and as recognized by the Examiner, the Ip patent does not disclose or suggest that the upper surface of the acceleration sensor die 20 and the upper surface of the ceramic case 40 are coplanar. Therefore, the Examiner relies on the Lutenegeger patent.

The Lutenegeger patent discloses a vane 10 having radially extending blades 12. Each of the blades 12 has opposite surfaces 14 and 16 facing in respective opposite directions of rotation. The blades 12 are provided with cavities 22 and 24 in which pressure sensors 26 are supported. The sizes of the cavities 22 and 24 and the pressure sensors 26 are related so that the pressure sensors 26 substantially fill the cavities 22 and 24 and so that the exposed surfaces of the pressure sensors 26 are substantially co-planar with the

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surfaces of the blades 12. The vane 10 is used to calculate the shearing modulus of soils or to measure dynamic soil response for use in earthquake analysis and design of foundations for machine vibrations.

The Examiner states that one of ordinary skill in the art, in view of the Lutenecker patent, would have readily recognized the advantages and desirability of arranging the upper surface of the acceleration sensor die 20 and the upper surface of the ceramic case 40 to be coplanar to more directly expose the acceleration sensor die 20 to the parameters being sensed so as to increase accuracy and reliability.

However, an acceleration sensor die 20 senses acceleration. There is no need for the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 to be coplanar when sensing acceleration. Accuracy and reliability of the acceleration sensor die 20 do not depend on the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 being coplanar. Also, the Ip patent does not suggest any need for mounting the acceleration sensor die 20 in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

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The Lutenegger patent does disclose a force sensor. However, the Lutenegger patent does not suggest any considerations that would suggest a need to mount the acceleration sensor die 20 in the ceramic case 40 of the Ip patent so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

Accordingly, because there is no suggestion in the Ip patent or in the Lutenegger patent that the acceleration sensor die 20 should be mounted in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar, independent claim 30 would not have been obvious to one of ordinary skill in the art over the Ip patent in view of the Lutenegger patent.

The Examiner alternatively relies on the Narita published EP application in the rejection of claim 30-32. The Narita published EP application shows an infrared filter 1 that is mounted in a case 7 so that the outwardly facing surfaces of the infrared filter 1 and the case 7 are apparently coplanar. An infrared sensor (not shown) is mounted within the case 7 so that the only light to which the sensor (not shown) is exposed is the infrared light passed by the infrared filter 7.

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The Examiner states that one of ordinary skill in the art, in view of the Narita published EP application, would have readily recognized the advantages and desirability of arranging the upper surface of the acceleration sensor die 20 and the upper surface of the ceramic case 40 to be coplanar to more directly expose the acceleration sensor die 20 to the parameters being sensed.

However, as discussed above, an acceleration sensor die 20 senses acceleration. There is no need for the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 to be coplanar when sensing acceleration. Accuracy and reliability of the acceleration sensor die 20 do not depend on the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 being coplanar. Also, the Ip patent does not suggest any need for mounting the acceleration sensor die 20 in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

With respect to the Narita published EP application, the infrared filter 1 forms a window that lets in only infrared light into the case 7. The actual sensor is not coplanar with a surface of the housing.

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Such considerations do not apply to the acceleration sensor die 20 and the ceramic case 40 disclosed in the Ip patent. Indeed, the Narita published EP application does not disclose any considerations that would suggest a need to mount the acceleration sensor die 20 in the ceramic case 40 of the Ip patent so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

Accordingly, because there is no suggestion in the Ip patent, the Narita published EP application, or elsewhere that the acceleration sensor die 20 should be mounted in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar, independent claim 30 would not have been obvious to one of ordinary skill in the art over the Ip patent in view of the Narita published EP application.

Because independent claim 30 would not have been obvious to one of ordinary skill in the art over the Ip patent in view of either the Lutenegeger patent or the Narita published EP application, dependent claims 31 and 32 likewise would not have been obvious to one of ordinary skill in the art over the Ip patent in view of either the Lutenegeger patent or the Narita published EP application.

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Examiner's Response - The Examiner argues (1) that force and acceleration are related by $F=ma$ and (ii) that rearrangement of parts requires only routine skill and are not patentable.

Applicants' Rebuttal - First, force and acceleration may be related, but they are not the same, especially in terms of sensors. A force sensor requires direct contact with the object exerting the force. An acceleration sensor requires no contact with anything. Accordingly, the considerations relating to housing acceleration sensors are different from the considerations relating to housing force sensors. For example, an acceleration sensor may be sealed within the interior of a housing to protect it from its environment. A force sensor, on the other hand, must have access to the object whose force is being sensed. The present invention is directed to a unique and inventive housing arrangement for such a force sensor.

Second, rearrangement of parts are only routine if they are routine. The present invention is not routine and has distinct advantages not taught in the prior art. Moreover, the present invention involves more than a rearrangement of parts.

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For all of the reasons given above, independent claim 30 and claims 31 and 32 dependent thereon are patentable over the Ip patent in view of the Lutenegger patent or in view of the Narita published EP application.

Moreover, dependent claim 31 further recites that the force sensing element has a thickness between the upper element surface and the lower element surface, that the housing includes a shelf, that the shelf supports the force sensing element within the well, and that the shelf has a depth with respect to the thickness of the force sensing element such that the upper element surface and the upper housing surface are coplanar.

The Examiner points to the step portion 3 disclosed in the Narita published EP application as the shelf recited in dependent claim 31. However, the step portion 3 disclosed in the Narita published EP application does not permit the upper element surface and the upper housing surface to be coplanar. That is, the step portion 3 is in the way. Therefore, a combination of the Ip patent and the Narita published EP application as suggested by the Examiner does not meet the limitations of dependent claim 31.

(It is noted that the Lutenegger patent does not disclose a shelf.)

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Additionally, as discussed above, it would not have been obvious to one of ordinary skill in the art to mount the acceleration sensor die 20 in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar because there is no advantage in so mounting the acceleration sensor die 20 in the ceramic case 40.

For all of the reasons given above, dependent claim 31 is patentable over the Ip patent in view of the Lutenegeger patent or in view of the Narita published EP application.

In section 2 of the Office Action, the Examiner rejected claims 44 and 45 under 35 U.S.C. §103 as being unpatentable over the Ip patent in view of the Lutenegeger patent or in view of the Narita published EP application and further in view of the Murakami patent.

The Murakami patent discloses a tablet 1 provided with a stylus pen 2 and a processing circuit 3. The tablet 1 includes a flat sensor 11, upper and lower reinforcement plates 12 and 13, a shielding plate 14 interposed between the flat sensor 11 and the lower reinforcement plate 13, and a vinyl plastic film cover 15. The flat sensor 11 has loop coil groups 16 and 17. The loop coil group 16 is comprised of a plurality of

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loop coils 16-1, 16-2, . . . , 16-48, and the loop coil group 17 is comprised of a plurality of loop coils 17-1, 17-2, . . . 17-48. The loop coil groups 16 and 17 are formed as a printed electrode pattern on the opposite faces of a single circuit board. An electromagnetic wave signal is transmitted between the tablet 1 and the pen 2 so as to produce a signal indicative of the position of the pen 2 on the tablet 1.

As can be seen, the Murakami patent does not disclose any considerations that would suggest a need to mount the acceleration sensor die 20 in the ceramic case 40 of the Ip patent so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

Accordingly, because there is no suggestion in the Ip patent, the Lutenegeger patent, the Narita published EP application, the Murakami patent, or elsewhere that the acceleration sensor die 20 should be mounted in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar, independent claim 30 would not have been obvious to one of ordinary skill in the art over the Ip patent in view of the Lutenegeger patent or in view of the

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Narita published EP application and further in view of the Murakami patent.

Because independent claim 30 is patentable over the Ip patent in view of the Lutenegger patent or in view of the Narita published EP application and further in view of the Murakami patent, dependent claims 44 and 45 are likewise patentable over the Ip patent in view of the Lutenegger patent or in view of the Narita published EP application and further in view of the Murakami patent.

Moreover, dependent claim 44 recites that a membrane covers the upper surfaces of the housing and the force sensing element in order to provide electrical isolation of the sensor package. The Murakami patent discloses a vinyl plastic film 15 covering the multiplayer structure. However, the Murakami patent does not indicate the purpose of the vinyl plastic film 15. Therefore, because the Murakami patent does not suggest any particular purpose for the vinyl plastic film 15, the Murakami patent does not suggest that the vinyl plastic film 15 provide electrical isolation.

For this additional reason, dependent claim 44 is patentable over the Ip patent in view of the Lutenegger patent or in view of the Narita published EP application and further in view of the Murakami patent.

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Dependent claim 45 recites that a membrane covers the upper surfaces of the housing and the force sensing element in order to provide environmental protection for the sensor package. The Murakami patent discloses a vinyl plastic film 15 covering the multiplayer structure. However, the Murakami patent does not indicate the purpose of the vinyl plastic film 15. Therefore, because the Murakami patent does not suggest any particular purpose for the vinyl plastic film 15, the Murakami patent does not suggest that the vinyl plastic film 15 provide environmental protection.

For this additional reason, dependent claim 45 is patentable over the Ip patent in view of the Lutenegeger patent or in view of the Narita published EP application and further in view of the Murakami patent.

In section 3 of the Office Action, the Examiner rejected independent claim 46 under 35 U.S.C. §103 as being unpatentable over the Ip patent in view of the Narita published EP application.

Applicants' Argument - As discussed above, an acceleration sensor die 20 senses acceleration. There is no need for the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 to be coplanar when sensing acceleration. Accuracy and reliability of the

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acceleration sensor die 20 do not depend on the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 being coplanar. Also, the Ip patent does not suggest any need for mounting the acceleration sensor die 20 in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

With respect to the Narita published EP application, the infrared filter 1 forms a window that lets in only infrared light into the case 7. Such a consideration does not apply to the acceleration sensor die 20 and the ceramic case 40 disclosed in the Ip patent. Indeed, the Narita published EP application does not suggest any considerations that would suggest a need to mount the acceleration sensor die 20 in the ceramic case 40 of the Ip patent so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar.

Accordingly, because there is no suggestion in the Ip patent, the Narita published EP application, or elsewhere that the acceleration sensor die 20 should be mounted in the ceramic case 40 so that the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 are coplanar, independent claim 46 would not have been

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obvious to one of ordinary skill in the art over the Ip patent in view of the Narita published EP application.

It is noted that the Examiner refers to the infrared filter 1 as a sensor. However, as is clear from the description in the Narita published EP application, the infrared filter 1 is a filter and the actual sensor (not shown) is contained in the case 7 behind the infrared filter 1.

Examiner's Response - The Examiner argues (i) that force and acceleration are related by $F=ma$, (ii) that rearrangement of parts requires only routine skill and are not patentable, and (iii) that security and effectiveness of the acceleration sensor die 20 depend on the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 being coplanar.

Applicants' Rebuttal - First, force and acceleration may be related, but they are not the same, especially in terms of sensors. A force sensor requires direct contact with the object exerting the force. An acceleration sensor requires no contact with anything. Accordingly, the considerations relating to housing acceleration sensors are different from the considerations relating to housing force sensors. For example, an acceleration sensor may be sealed within the

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interior of a housing to protect it from its environment. A force sensor, on the other hand, must have access to the object whose force is being sensed. The present invention is directed to a unique and inventive housing arrangement for such a force sensor.

Second, rearrangement of parts are only routine if they are routine. The present invention is not routine and has distinct advantages not taught in the prior art. Moreover, the present invention involves more than a rearrangement of parts.

Third, security and effectiveness of the acceleration sensor die 20 do not depend on the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 being coplanar. Indeed, security necessitates a different mounting arrangement than that proposed by the Examiner.

For all of the reasons given above, independent claim 46 is patentable over the Ip patent in view of the Narita published EP application.

In section 4 of the Office Action, the Examiner rejected dependent claims 51 and 52 under 35 U.S.C. §103 as being unpatentable over the Ip patent in view of the Lutenecker patent and the Narita published EP application and further in view of the Murakami patent.

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However, as discussed above, the combination of the Ip patent, the Lutenegger patent, the Narita published EP application, and the Murakami patent does not suggest a coplanar relationship between the upper surfaces of the acceleration sensor die 20 and the ceramic case 40 disclosed in the IP patent. Accordingly, independent claim 46 is patentable over the Ip patent in view of the Lutenegger patent and the Narita published EP application and further in view of the Murakami patent.

Therefore, dependent claims 51 and 52 are likewise patentable over the Ip patent in view of the Lutenegger patent and the Narita published EP application and further in view of the Murakami patent.

Moreover, dependent claim 51 recites that a membrane covers the upper surfaces of the housing and the force sensing element in order to provide electrical isolation of the sensor package. The Murakami patent discloses a vinyl plastic film 15 covering the multiplayer structure. However, the Murakami patent does not indicate the purpose of the vinyl plastic film 15. Therefore, because the Murakami patent does not suggest any particular purpose for the vinyl plastic film 15, the Murakami patent does not suggest that the vinyl plastic film 15 provide electrical isolation.

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For this additional reason, dependent claim 51 is patentable over the Ip patent in view of the Lutenegger patent and the Narita published EP application and further in view of the Murakami patent.

Dependent claim 52 recites that a membrane covers the upper surfaces of the housing and the force sensing element in order to provide environmental protection for the sensor package. The Murakami patent discloses a vinyl plastic film 15 covering the multiplayer structure. However, the Murakami patent does not indicate the purpose of the vinyl plastic film 15. Therefore, because the Murakami patent does not suggest any particular purpose for the vinyl plastic film 15, the Murakami patent does not suggest that the vinyl plastic film 15 provide environmental protection.

For this additional reason, dependent claim 52 is patentable over the Ip patent in view of the Lutenegger patent and the Narita published EP application and further in view of the Murakami patent.

In section 5 of the Office Action, the Examiner rejected independent claim 53 under 35 U.S.C. §103 as being unpatentable over the Ip patent in view of the Frederick patent.

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Applicants' Argument - Independent claim 53 is directed to a method of packaging a force sensing element. The force sensing element has an outwardly facing element surface, and the outwardly facing element surface has an edge therearound. According to the method, the force sensing element is applied to a housing part having an outwardly facing housing surface so that the edge of the outwardly facing element surface abuts an edge of the outwardly facing housing surface, and the force sensing element is attached to the housing part.

As the Examiner recognizes, the Ip patent does not show that the edge of the outwardly facing surface of the acceleration sensor die 20 abuts the edge of the outwardly facing surface of the ceramic case 40. Accordingly, the Examiner relies on the Frederick patent.

The Frederick patent shows sections of conduit 18 coupled together by coupling devices 20 and junction boxes 22. Each junction box 22 includes an ultrasonic intrusion sensor. The ultrasonic intrusion sensor includes a piezoelectric transducer 26, which is mounted on a front panel 28 by a nut 30. The piezoelectric transducer 26 protrudes beyond the front surface of the front panel 28 and into a hole in a rain shield 34. The

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front surface of the rain shield 34 is essentially coplanar with the front surface of the transducer 26.

The Examiner has stated that one of ordinary skill in the art, in view of the Frederick patent, would have readily recognized the advantages and desirability of arranging the upper surface of the acceleration sensor die 20 and the upper surface of the ceramic case 40 so that the edge of the outwardly facing surface of the acceleration sensor die 20 abuts the edge of the outwardly facing surface of the ceramic case 40.

However, there are no advantages and desirability of arranging the upper surface of the acceleration sensor die 20 and the upper surface of the ceramic case 40 so that the edge of the outwardly facing surface of the acceleration sensor die 20 abuts the edge of the outwardly facing surface of the ceramic case 40.

The acceleration sensor die 20 senses acceleration. There is no need for the edge of the outwardly facing surface of the acceleration sensor die 20 to abut the edge of the outwardly facing surface of the ceramic case 40 when sensing acceleration. Accuracy and reliability of the acceleration sensor die 20 do not depend on the edge of the outwardly facing surface of the acceleration sensor die 20 abutting the edge of the

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outwardly facing surface of the ceramic case 40. Also, the Ip patent does not suggest any need for mounting the acceleration sensor die 20 in the ceramic case 40 so that the edge of the outwardly facing surface of the acceleration sensor die 20 abuts the edge of the outwardly facing surface of the ceramic case 40.

With respect to the Frederick patent, the relationship between the edges of the front surfaces of the ultrasonic intrusion transducer 26, the threaded mounting 30, and the rain shield 34, although not stated in the Frederick patent, is one of angular coverage of the ultrasonic energy that is transmitted and received by the ultrasonic intrusion transducer 26. Such considerations do not apply to the acceleration sensor die 20 and the ceramic case 40 disclosed in the Ip patent. Indeed, the Frederick patent does not suggest any considerations that would suggest a need to mount the acceleration sensor die 20 in the ceramic case 40 of the Ip patent so that the edge of the outwardly facing surface of the acceleration sensor die 20 abuts the edge of the outwardly facing surface of the ceramic case 40.

Accordingly, because there is no suggestion in the Ip patent, the Frederick patent, or elsewhere that the acceleration sensor die 20 should be mounted in the

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ceramic case 40 so that the edge of the outwardly facing surface of the acceleration sensor die 20 abuts the edge of the outwardly facing surface of the ceramic case 40, independent claim 53 would not have been obvious to one of ordinary skill in the art over the Ip patent in view of the Frederick patent.

Examiner's Response - The Examiner argues that it would have been obvious to modify the sensor package disclosed in the Ip patent using the teachings of the Frederick patent by securing the sensing element against loss or displacement.

Applicants' Rebuttal - The sensing element is better secured against loss or displacement if it is buried within the housing instead of being placed at the surface of the housing, especially considering that an acceleration sensor can sense acceleration equally well in either position. Thus, because an acceleration sensor can sense acceleration equally well in either position, other considerations dictate that the acceleration sensor not have a surface coplanar with a surface of the housing.

For all of the reasons given above, independent claim 53 is patentable over the Ip patent in view of the Frederick patent.

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In section 6 of the Office Action, the Examiner rejected dependent claim 54 under 35 U.S.C. §103 as being unpatentable over the Ip patent in view of the Lutenegger patent and further in view of the Narita published EP application.

Because the claim from which claim 54 depends, i.e., independent claim 53, was rejected as being unpatentable over the Ip patent in view of the Frederick patent, applicants assume that the Examiner meant to apply the combination of the Ip patent, the Frederick patent, and the Narita published EP application against dependent claim 54 instead of the combination of the Ip patent, the Lutenegger patent, and the Narita published EP application.

The combination of the Ip patent, the Frederick patent, and the Narita published EP application does not suggest an abutting edge relationship between the outwardly facing surfaces of the acceleration sensor die 20 and the ceramic case 40 disclosed in the IP patent. Accordingly, independent claim 53 is patentable over the Ip patent in view of the Frederick patent and further in view of the Narita published EP application, and dependent claim 54, therefore, is likewise patentable over the Ip patent in view of the Frederick patent and

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further in view of the Narita published EP application
the Narita published EP application.

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CONCLUSION

In view of the above, it is clear that the claims of the present invention are patentable. Accordingly, allowance of these claims and issuance of this patent application are respectfully requested.

Respectfully submitted,

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September 24, 2003